



Mark Scheme (Results)

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Answer	Mark
1(a)	1. slime layer / (slime) capsule ; 2. cell wall ; 3. circular DNA / loop of DNA / nucleoid / eq ; 4. plasmids ; 5. { 70s / small / eq } ribosomes ; 6. pili ; 7. allow reference to mesosome ;	(3)

Question Number	Answer	Mark															
1(b)	<table border="1"> <thead> <tr> <th>Organelle</th> <th>Single membrane</th> <th>Double membrane</th> </tr> </thead> <tbody> <tr> <td>nucleus</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Golgi apparatus</td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>mitochondrion</td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>lysosome</td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> </tbody> </table>	Organelle	Single membrane	Double membrane	nucleus		<input checked="" type="checkbox"/>	Golgi apparatus	<input checked="" type="checkbox"/>		mitochondrion		<input checked="" type="checkbox"/>	lysosome	<input checked="" type="checkbox"/>		(4)
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Question Number	Answer	Mark
2 (a)	<ol style="list-style-type: none">1. zygote ;2. 16 ;3. totipotent ;4. pluripotent ;	(4)

Question Number	Answer	Mark
2 (b)	<ol style="list-style-type: none">1. idea of risk of { infection / disease / pathogens / eq } from the donor;2. idea of risk of infection from contaminated equipment during the procedure / eq ;3. risk of cancer / abnormal growth / eq ;4. rejection /eq ;5. reference to increased susceptibility to infections due to immunosuppressant drugs;	(3)

Question Number	Answer	Mark
3(a)(i)	D ;	(1)

Question Number	Answer	Mark
3(a)(ii)	A ;	(1)

Question Number	Answer	Mark
3(a)(iii)	B ;	(1)

Question Number	Answer	Mark
3(b)(i)	<ol style="list-style-type: none"> 1. idea of one (or a few) cell types / a group of cells ; 2. idea of working together for the { same / specific /one / eq } function ; 3. often have the same origin / eq ; 	(2)

Question Number	Answer	Mark
3(b)(ii)	<ol style="list-style-type: none"> 1. transport of water / eq ; 2. transport of minerals / eq ; 3. (structural) support / eq ; 	(2)

Question Number	Answer	Mark
* 3(c)	<p>(QWC– Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none">1. (<i>cellulose</i>) contains <u>beta</u> <i>glucose</i> / eq ;2. (glucose molecules) joined by <i>condensation</i> reactions ;3. appropriate reference to <i>glycosidic</i> bonds ;4. appropriate reference to (only) 1- 4 (glycosidic bonds) ;5. reference to inversion of alternate glucose molecules in the chain ;6. { unbranched / straight } chain ;7. idea of microfibril composed of many <i>cellulose molecules</i> ;8. (cellulose chains) held together by <i>hydrogen</i> bonds ;	(4)

Question Number	Answer	Mark
4(a)	1. the number of species ; 2. in {an area /one location /habitat} ;	(2)

Question Number	Answer	Mark
4(b)(i)	1. relevant comment on the { presence / absence / eq } of named species ; 2. reduced {species richness / biodiversity / number of species} ; 3. increase in numbers of {dandelion / plantain} because of less competition / eq ; 4. idea that this will have an effect on food chains ;	(2)

Question Number	Answer	Mark
4(b)(ii)	1. { number of different / variety of } alleles ; 2. in a { gene pool / population / species } eq;	(2)

Question Number	Answer	Mark
4 (c) (i)	<ol style="list-style-type: none"> 1. { take up less space / smaller } so more can be stored / eq ; 2. idea of greater genetic { diversity / variation } if large numbers of seed are stored ; 3. can be stored for a long time /reference to dormancy ; 4. idea of different species of plant being stored in { same/similar} conditions; 5. idea of not requiring maintenance in the same way as growing plants ; 6. reference to economic advantage / reduced cost ; 	(3)

Question Number	Answer	Mark
4(c) (ii)	<ol style="list-style-type: none"> 1. reduce { enzyme activity / metabolic processes / respiration / eq } in seed ; 2. seed less likely to germinate / seed kept dormant / eq ; 3. reduce { enzyme activity / growth / eq } of { bacteria / fungi / micro-organisms / eq }; 4. decreases rate of decomposition / eq ; 	(3)

Question Number	Answer	Mark
5(a)	(ability to) { kill / slow down growth of/eq } { bacteria / fungi / micro-organisms / eq } ;	(1)

Question Number	Answer	Mark
5(b)(i)	so bacteria distributed { throughout / evenly / eq } / idea of agar as source of nutrient ;	(1)

Question Number	Answer	Mark
5(b)(ii)	<ol style="list-style-type: none"> 1. prevents contamination (by other bacteria) / eq ; 2. prevent competition between bacteria / eq ; 3. stop { pathogenic / eq } bacteria being cultured / eq ; 4. idea of making the investigation valid / eq ; 	(2)

Question Number	Answer	Mark
5(b)(iii)	<ol style="list-style-type: none"> 1. allows { air / oxygen } in / prevents anaerobic conditions ; 2. <u>oxygen</u> required for (aerobic) <u>respiration</u> by bacteria ; 3. idea of conditions not encouraging growth of { pathogenic / harmful / eq } bacteria ; 	(2)

Question Number	Answer	Mark
5(b)(iv)	<ol style="list-style-type: none"> 1. idea of appropriate temperature e.g. 20 °C to 30 °C ; 2. idea that at { 37 °C/above 30 °C/ body temperature } { pathogenic / eq } bacteria would be encouraged to grow ; 	(2)

Question Number	Answer	Mark
5(b) (v)	<ol style="list-style-type: none">1. reference to { zone of inhibition / clear area / eq } ;2. no bacteria { growing / present } in clear area ;3. (antimicrobial substance in disc A) inhibits growth of bacteria / kills bacteria / eq ;4. reference to diffusion of substance from disc A ;	(3)

Question Number	Answer	Mark
* 6(a)	<p>(QWC– Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. Idea of genetically similar plants e.g. clones, cuttings, explants or seedlings from same parent plant ; 2. plants all of same { age /size } (at start) ; 3. reference to at least five different nitrate concentrations ; 4. sensible range of different nitrate concentrations either side of and including 200 (ppm) ; 5. correct reference to any two abiotic variables that need to be kept constant ; 6. idea of sensible measure of growth e.g. mass / number of leaves / length of roots / height of plant ; 7. time allowed for growth { weeks / months } ; 8. appropriate reference to repeats, e.g. replication at <u>each concentration</u> or repeating the whole experiment and calculating mean from data ; 	(5)

Question Number	Answer	Mark
6(b)(i)	<ol style="list-style-type: none"> 1. any pH from the range 6.5 – 8.0 ; 2. { high / highest } (availability) of all mineral ions / highest availability for { nitrate / calcium / magnesium / phosphate } ; 	(2)

Question Number	Answer	Mark
6(b)(ii)	1. reduced availability of magnesium / eq ; 2. (magnesium) needed for synthesis of chlorophyll ; OR 3. reduced availability of nitrate / eq ; 4. fewer leaves / less protein synthesised / less chlorophyll produced / eq ; OR 5. reduced availability of phosphate / eq ; 6. phosphate needed for ATP / ADP / NADP ; OR 7. reduced availability of calcium / eq ; 8. idea of root growth inhibited / middle lamellae cannot form ;	(2)

Question Number	Answer	Mark												
7(a)	<table border="1"> <thead> <tr> <th>Possible adaptation of the ladybird beetle</th> <th>Behavioural</th> <th>Anatomical</th> <th>Physiological</th> </tr> </thead> <tbody> <tr> <td>Production of chemicals in the blood that taste bad to predators</td> <td></td> <td></td> <td style="text-align: center;">☒</td> </tr> <tr> <td>Clustering together with other ladybird beetles during cold weather</td> <td style="text-align: center;">☒</td> <td></td> <td></td> </tr> </tbody> </table>	Possible adaptation of the ladybird beetle	Behavioural	Anatomical	Physiological	Production of chemicals in the blood that taste bad to predators			☒	Clustering together with other ladybird beetles during cold weather	☒			(2)
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Question Number	Answer	Mark
7 (b) (i)	idea that the (species / eq) is restricted in its distribution / species only found in one specific { location / area / eq } ;	(1)

Question Number	Answer	Mark
7 (b) (ii)	<ol style="list-style-type: none"> 1. appropriate reference to meiosis ; 2. { crossing over / chiasmata } of { chromatids / chromosomes } / eq ; 3. { independent / random } assortment of { chromosomes / alleles } / eq ; 4. random { fertilisation / mating } / eq ; 5. mutations / eq ; 	(3)

Question Number	Answer	Mark
7 (b) (iii)	<ol style="list-style-type: none"> 1. idea of selection pressure / change in environment; 2. reference to competition / predation ; 3. mutation (in ladybird) ; 4. idea of advantageous allele; 5. idea that individuals with advantageous { alleles / characteristics / eq } survive and breed ; 6. idea of (advantageous) { allele / mutation } being passed on (to future generations) ; 7. idea of more individuals with this adaptation in the population / increased frequency of advantageous alleles in the population ; 	(4)

Question Number	Answer	Mark
8 (a)	1. growth (of organism) / increase in cell numbers / eq ; 2. asexual reproduction / production of clones / eq ; 3. repair of tissues / replacement of cells / eq ; 4. idea of control of cell { growth / division / mitosis } ;	(2)

Question Number	Answer	Mark
8 (b) (i)	{ carcinogens / cigarettes / tobacco / eq } / { ionising radiation / X-rays } / asbestos ;	(1)

Question Number	Answer	Mark
8 (b) (ii)	1. shorter growth or G phase / shorter interphase ; 2. { shorter / faster } cycle; 3. idea of usual { controls/ 'stops' } not { working/effective } / cell divides uncontrollably ; 4. cells do not become specialised ;	(2)

Question Number	Answer	Mark
8 (c) (i)	30 ;	(1)

Question Number	Answer	Mark
8(c)(ii)	<ol style="list-style-type: none"> 1. idea of positive correlation ; 2. non-linear increase described / exponential increase / eq ; 3. credit manipulation of data ; 	(3)

Question Number	Answer	Mark
8(c)(iii)	Mitosis ;	(1)

Question Number	Answer	Mark
8(d)	<ol style="list-style-type: none"> 1. idea of correct stimulus e.g. chemical ; 2. some genes active / some genes inactive / eq ; 3. only the active genes are transcribed / eq ; 4. mRNA made (only at active genes) / eq ; 5. protein made / eq ; 6. cell {structure / function} determined / cell permanently modified / eq ; 	(3)